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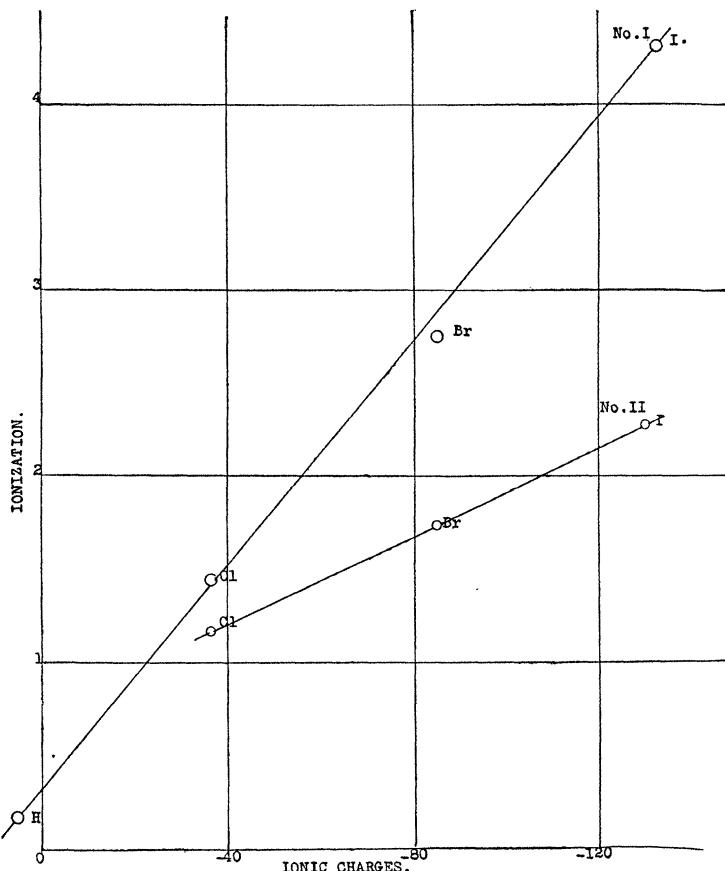
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greater the ionization. This relation is shown graphically in the following curves, where No. I. shows the mean ionization produced by the β and γ rays as compared with the ionic charges and No. II. shows the same relation for the α radiation.

FERNANDO SANFORD

STANFORD UNIVERSITY,
September 30, 1913

SCIENTIFIC BOOKS

THE MARYLAND DEVONIAN BOOKS

THE fine series of volumes issued by the Maryland Geological Survey (Professor Wm. Bullock Clark, state geologist) has recently

¹ Maryland Geological Survey: Lower Devonian. Text, 560 p.; Middle and Upper Devonian. Text, 719 p.; Plates (Lower Devonian, 1-98; Middle Devonian, 7-44; Upper Devonian, 45-73). Baltimore, The Johns Hopkins Press, 1913.

been substantially supplemented in number and enhanced in worth by the publication of what may, for brevity, be styled the "Maryland Devonian Books."¹

Following the tasteful pattern and admirable mechanical execution of the previous members of the series, the Devonian books constitute a graceful and enduring monument to the scientific vigor of the State of Maryland in which His Excellency, The Honorable Phillips Lee Goldsborough, and his distinguished colleagues of the Geological Survey Commission may take a just and satisfying pride. These books are three stout volumes and the golden device of the state which they carry on their covers declares that good men have done this work at the command of the presiding genius of Maryland. The accomplishment of this undertaking is the fulfilment

of a long promise and there need be no reserve in saying that the result is destined to be of great value and durable service to geological science.

Amid the diversified output of official reports on American geology there has been nothing like this before—a monograph of a single geological system and its component faunas, wherein is given in detail all that is known of the local development of the system within definite, if artificial, boundaries. The very expression of this fact, the realization that here is a work of ultimate reference in this field, brings with it the wish that other states might have done like this for their own domain and to the great advantage of those who seek to interpret the causes and sequences of geology along the broader lines. Many expert men have participated in the creation of this work; and here again, as so often, our venerable adages break down, for many cooks have neither spoiled the broth nor have many hands made light work; for first, the collaborators speak with reasonable finality, and again, the conception of the state geologist has labored long and hard, through many years, to this successful parturition.

The writer, having played a certain rôle in the rendering of this composition, must refrain from any exuberant notice of it. Nor would a critical review of the contents of the work be appropriate to these columns. All in due time the geological coroner with his hypotheses will be along to hold his inquest over the *corpus delicti*.

Volume 1 is devoted to the Lower Devonian, volume 2 to the Middle and Upper Devonian, and volume 3 consists of 165 plates, including 2,500–3,000 figures of fossils. The text volumes are embellished with many half-tones of geological scenery and accompanied by section sheets in cover pockets, and volume 1 carries a map of Maryland with the Appalachian distribution of the Devonian members accurately colored.

The introductory chapter on the general relations of the Devonian by Dr. Swartz points out succinctly the correlation of the formation in its various aspects, laying special

emphasis on the discrimination of shore-line and subcontinental deposits at the east from contemporaneous marine deposits toward the west, in correspondence with later Devonian conditions northward in Appalachia. Professor Schuchert has presented the paleogeography of the Devonian with the aid of a series of paleogeographic maps of North America, which illuminate the procession of geographical changes and are serviceable for dogmatic purposes, even though recent blows of the hammer have torn some cavernous rents in them.

Dr. Prosser contributes the Historical Review and Bibliography.

The lengthy chapter on the Lower Devonian Deposits is the work of Messrs. Schuchert, Swartz, Maynard and the late R. B. Rowe, each responsible for a special section, Mr. Schuchert for the general introduction, Messrs. Swartz, Maynard and Rowe for the determinative stratigraphy, Dr. Swartz for the formation correlation. All four have shared in the "Local Sections," a chapter with which the geological portion of the volume closes.

In the descriptive paleontology which follows, the chapters and their authors are these: Cœlenterata, by Dr. Swartz; Cystidea, by Professor Schuchert; Crinoidea and Vermes, by D. W. Ohern; Bryozoa, by Drs. Ulrich and Bassler; Brachiopoda, by Professor Schuchert and Mr. Maynard; Mollusca and Trilobites, by Messrs. Ohern and Maynard; Ostracoda, by Drs. Ulrich and Bassler.

Thus briefly are the contents of this volume 1 indicated, but only the stratigrapher and paleontologist will appreciate the penetration of these analytical studies. Perhaps a leading feature of the stratigraphy is that expressed by the authors of their conception of the "Keyser member" of the series and the discussion of its correlation value with contemporaneous Appalachian deposits elsewhere. This is a succession of homogeneous limey sediments with a thickness of several hundred feet which are assigned a place at the base of the Devonian system. The deposits are continuous into Pennsylvania, but their equivalents northward in New Jersey

and New York are known by other names, and the discussion of their correlation raises delicate questions of fact and interpretation.

A very distinctive part of the paleontological chapters is Professor Schuchert's treatise on the cystids, a somewhat expanded account of his earlier descriptions and illustrations of these genera and species which attained a noteworthy development in the "Keyser member." There are attractive novelties among the crinoids, fine Bassler-photos appear among the Bryozoa, familiar drawings among the profusion of brachiopods and Mollusca, very interesting trilobites, regarding which the writer ventures to intimate (by way of neutralizing too much blandiloquence) that *Homalonotus swartzii* Ohern (Pl. 90) is *H. vanuxemi* Hall (*vanuxemi-major-perceensis* type), that *Dalmanites keyserensis* Swartz (Pl. 91, Figs. 5, 8, 9) is *D. micrurus* Green and that the object figured on Pl. 92 (Fig. 3) as the hypostoma of *D. multiannulatus* Ohern is not an hypostoma, but the very interesting bifurcate anterior limb of the cephalon.

Volume 2 opens with a discussion of the Middle Devonian, its subdivision and correlation, the major part of which is by Dr. Prosser, who has, with his usual perspicacity and justness, discussed the characters of these sediments and their correlation values. The Maryland geologists have felt impelled to follow the usage of the U. S. Geological Survey in adopting the term "Romney" (West Virginia place-name) to embrace the members which in New York are known as the Onondaga, Marcellus and Hamilton. Each of these is a recognizable factor in the composition of the Romney although the Onondaga has a distinctly peculiar development in lithology. And, says Dr. Prosser, "there are obstacles in the way of attempting to map these divisions separately due largely to the gradual change from the lithological characters of one member to another. . . . It was thought best to regard the stages as constituting one formation." The distinctive character of the Onondaga member is a matter of much interest because of its essential departure from its calcareous expression at the north. Lime-

stone deposition is largely replaced by black shales of the type of the Marcellus, and would, in the opinion of Dr. Swartz, who has contributed the special section on this formation, indicate the increase southward of the replacement which is already evident in western New York.

Dr. Kindle contributes a concluding and philosophical chapter on the relations of the faunas to the sediments.

The systematic paleontology of the Middle Devonian has been prepared chiefly by Drs. Prosser and Kindle, the Bryozoa by Drs. Ulrich and Bassler.

Thereupon follows a treatise on the Upper Devonian deposits by Drs. Prosser and Swartz, with the correlation essay and the local sections by Swartz, and finally the descriptive paleontology by Clarke and Swartz. The entire Upper Devonian series in Maryland is divided into a lower marine—the Jennings formation—and an upper non-marine—the Catskill. In the matter of stratigraphy and faunal succession the Maryland Upper Devonian shows a closer relationship with the carefully elaborated Upper Devonian of New York than is as yet known from any other region outside the latter. But even with this close affiliation it has seemed necessary to meet present requirements by interposing new stratigraphic terms. The black shale and peculiar fauna of the Genesee member at the base of this series stand confirmed, but above it the Portage beds with the Naples fauna and the higher Ithaca fauna are embraced by the term "Woodmont shale member." Overlying is the "Parkhead sandstone member" which seems, in place and fauna, to be equivalent to the Enfield member or Unadilla terrane of New York (*Ithaca* in its old and broader sense). The "Chemung sandstone member" has effectively the place and value of the Chemung in New York.

What has been thus said may serve to indicate in small part the purport and presentations of this work. Its collaborators have done honorably and with credit to themselves and their themes in perfecting an encyclopedia of a great geological system in an

important Appalachian field; by means of its correspondences and contrasts with the developments elsewhere of the Appalachian Devonian trough-seas are made more lucid. The writer feels at liberty to speak thus, as he frankly concedes that his part of the book, done ten years ago and laid aside, has been more appropriately attired by the generous labors of Dr. Swartz.

Though the writer's appearance in SCIENCE as reviewer of these volumes is due to the solicitation of its editor, he may take advantage of that fact to express the conviction, which will be shared by all students of the Devonian, that this work is a distinct credit to the science and its accomplishment an added honor to the distinguished head of the Maryland Geological Survey.

JOHN M. CLARKE

Technical Gas and Fuel Analysis. By ALFRED H. WHITE, Professor of Chemical Engineering, University of Michigan. Published by McGraw-Hill Book Company as one of the International Chemical Series. 1913. Pp. 255. \$2.00 net.

The book contains seventeen chapters, the first twelve of which deal with gas analysis, the thirteenth with the analysis of liquid fuels, and the remaining four with the analysis of coal.

The methods described in the chapter on the sampling and storage of gases are open to objection in that water is used as the confining liquid. The author carefully emphasizes the fact that the water to be used must be saturated with the gas in question; but changes in temperature and changes in the composition of the gas are sufficient to change the amounts of the various constituents dissolved in the confining liquid. Such changes are to be expected when the gas sampling extends over an appreciable time interval, and render worthless the results of the analysis in the case of certain gas mixtures. There is no objection to using water in sampling gases of low solubility where extremely accurate results are not required, but such a condition does not frequently arise.

No description is given of the apparatus most commonly employed in technical gas analysis at the present time, *i. e.*, the original Hempel apparatus, the author's modification of both the burette and the pipettes being offered in its place. In the opinion of the reviewer, the Hempel apparatus deserves a prominent place in any text-book on gas analysis because of the simplicity of its manipulation and the rapidity with which results that are sufficiently accurate for most technical purposes may be obtained. The slightly greater accuracy obtainable with the White apparatus does not seem to warrant its general use when the longer time and greater inconvenience that are considered.

In the chapter on methods of explosion and combustion, emphasis should have been laid upon the necessity of employing mercury in the burettes that are used with the explosion and combustion pipettes, and in the combustion of methane over copper oxide, on account of the solubility in water of the carbon dioxide that is formed. In this connection, the statement on page 57 concerning the combustion of methane over copper oxide needs revision: "If the gas had been passed back and forth into a pipette filled with water during the combustion there would have been no change in volume, but since the gas was passed into the caustic pipette during the combustion process and the CO₂ was absorbed the contraction equals the methane." A similar sentence also occurs later on the same page.

In the discussion (p. 85) on the combustion of hydrogen, the author criticizes the method of Dennis and Hopkins on the basis of the formation of oxides of nitrogen, on what seems to the reviewer insufficient evidence that was published twelve years ago. He seems to have overlooked the results obtained by Rhodes.¹ These results show that the volume of the oxides of nitrogen that are formed when the combustion is properly performed is always less than .01 c.c., a figure so small as to be negligible.

The author dismisses the subject of the various improved forms of the Orsat apparatus recently placed on the market with a short

¹ Dennis's "Gas Analysis," page 153.

paragraph which closes with the following sentence: "There are decided objections to complication in any form of apparatus which may receive rough treatment in transportation and which is frequently handled carelessly by its operators." It is surprising to note that the author gives preference to a form of apparatus because it is able to withstand "rough treatment" and "careless handling," when it has repeatedly been shown that the apparatus gives erroneous results.

The chapter on exact gas analysis contains a description of two burettes designed by the author. The bulbed gas burette is an improvement over the Pettersson-Hempel gas burette for exact gas analysis with respect to the accuracy with which gas volumes may be read.

Under the methods for the determination of the heating value of a gas, the Junkers calorimeter is taken up in detail, brief mention is made of the Hempel, Graefe, Parr, and Doherty calorimeters, and one paragraph is devoted to the discussion of automatic and recording gas calorimeters. The material in this chapter is excellent. The use of the definition of what is known usually as "total" heating value to define the "gross" heating value is confusing, especially since later in the chapter there is given a table of corrections to obtain the "total" heating value from the observed or "gross" heating value. This chapter also includes a description of the sling psychrometer for determining moisture in air, since the moisture content is one of the variables upon which the value of the above correction depends. The whirling psychrometer is not mentioned.

There is a short chapter on the determination of suspended particles in gas, a subject which has hitherto not been given the prominence it deserves in books of this character. In the words of the author, this is a subject which "is daily becoming of greater importance on account of legal restrictions on pollution of the air and on account of insistence on closer control of industrial operations by manufacturers."

The remainder of the twelve chapters on gas analysis is devoted to a discussion of chimney

gas, producer gas, illuminating gas and natural gas, including methods of analysis and the application and interpretation of the results.

The chapter on liquid fuels is short and not so comprehensive as one would expect from the title of the book.

Under coal analysis, there is one chapter on sampling, one on the chemical analysis and two on the determination of the heating value by various methods. Frequent references are made in these chapters to the results of the investigations of the Joint Committee on Coal Analysis of the American Chemical Society and the Society for Testing Materials, of the Bureau of Mines and of the Bureau of Standards.

Typographical errors occur occasionally, e. g., Ernshaw for Earnshaw, page 81, naphthalene for naphthalene, pages 164 and 169, and Kjehldahl for Kjeldahl, page 210; there is a lack of punctuation, especially of commas, which renders some of the sentences ambiguous; peculiar constructions are present, e. g., "Chapter II. describes the apparatus which the author believes best adapted to technical gas analysis and gives detailed directions for its manipulation," page 61, and "These gases (sulphur dioxide and sulphur trioxide) are absorbed, oxidized to sulphuric acid and weighed as barium sulphate," page 162; and finally, "estimation" is used throughout the book in place of "determination."

The book is well illustrated; all determinations that involve computations are clearly explained by the aid of concrete examples; and eight useful tables are appended at the close.

R. P. ANDERSON

CORNELL UNIVERSITY,
DEPARTMENT OF CHEMISTRY,
October 24, 1913

*PROFESSOR NOGUCHI'S RESEARCHES ON
INFECTIVE DISEASES¹*

THE Royal Society of Medicine mostly limits the record of its work to its own *Proceedings* and the medical journals; and it does well to observe this wise rule. But from

¹ From *Nature*.